Final
Conventional Explosives Safety Submission

Ordnance and Explosives (OE) Removal Action
Eastern Bypass
Amendment 1

Fort McClellan, Alabama

Delivery Order 0010
Contract Number DACA87-99-D-0010

U.S. Army Corps of Engineers
Engineering and Support Center
Huntsville, Alabama

Geographical Corps District:
US Army Corps of Engineers, Mobile District

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Huntsville, Alabama

October 2002

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LIST OF ACRONYMS

AEDA	Ammunition, Explosives, and Dangerous Articles
ALDOT	Alabama Department of Transportation
ANG	Army National Guard
AP-T	Armor Piercing-Tracer
ASP	Ammunition Supply Point
ASR	Archive Search Report
BCT	Base Realignment And Closure Cleanup Team
BIP	Blow In Place
BRAC	Base Realignment And Closure
CCTV	Closed Circuit Television
CEHNC	Corps of Engineers, Huntsville Center
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CWM	Chemical Warfare Materiel
DDESB	Department of Defense Explosives Safety Board
DGPS	Differential Global Positioning System
DID	Data Item Description
DOD / DoD	Department Of Defense
EBP	Eastern Bypass
EE/CA	Engineering Evaluation/Cost Analysis
EODT	EOD Technologies Inc.
ESS	Explosives Safety Submission
ft	Foot / Feet
FWENC	Foster Wheeler Environmental Corporation
HEAT	High Explosive Anti-Tank
IAW	In Accordance With
illum	Illumination
JPA	Joint Powers Authority
mm	Millimeter
MPM	Most Probable Munition
MSD	Minimum Separation Distance
NEW	Net Explosive Weight
OE	Ordnance Explosives
OSHA	Occupational Safety and Health Administration / Act
QA	Quality Assurance
QC	Quality Control
QD	Quantity Distance
ROW	Right of Way
SUXOS	Senior UXO Supervisor
U.S.	United States
USACE	United States Army Corps of Engineers
USAESCH	U.S. Army Engineering Support Center, Huntsville
USRADS	Ultrasonic Ranging and Data System
UXO	Unexploded Ordnance
UXOQC	UXO Quality Control
UXOSO	UXO Safety Officer
VL	Verification Level

1.0 INTRODUCTION

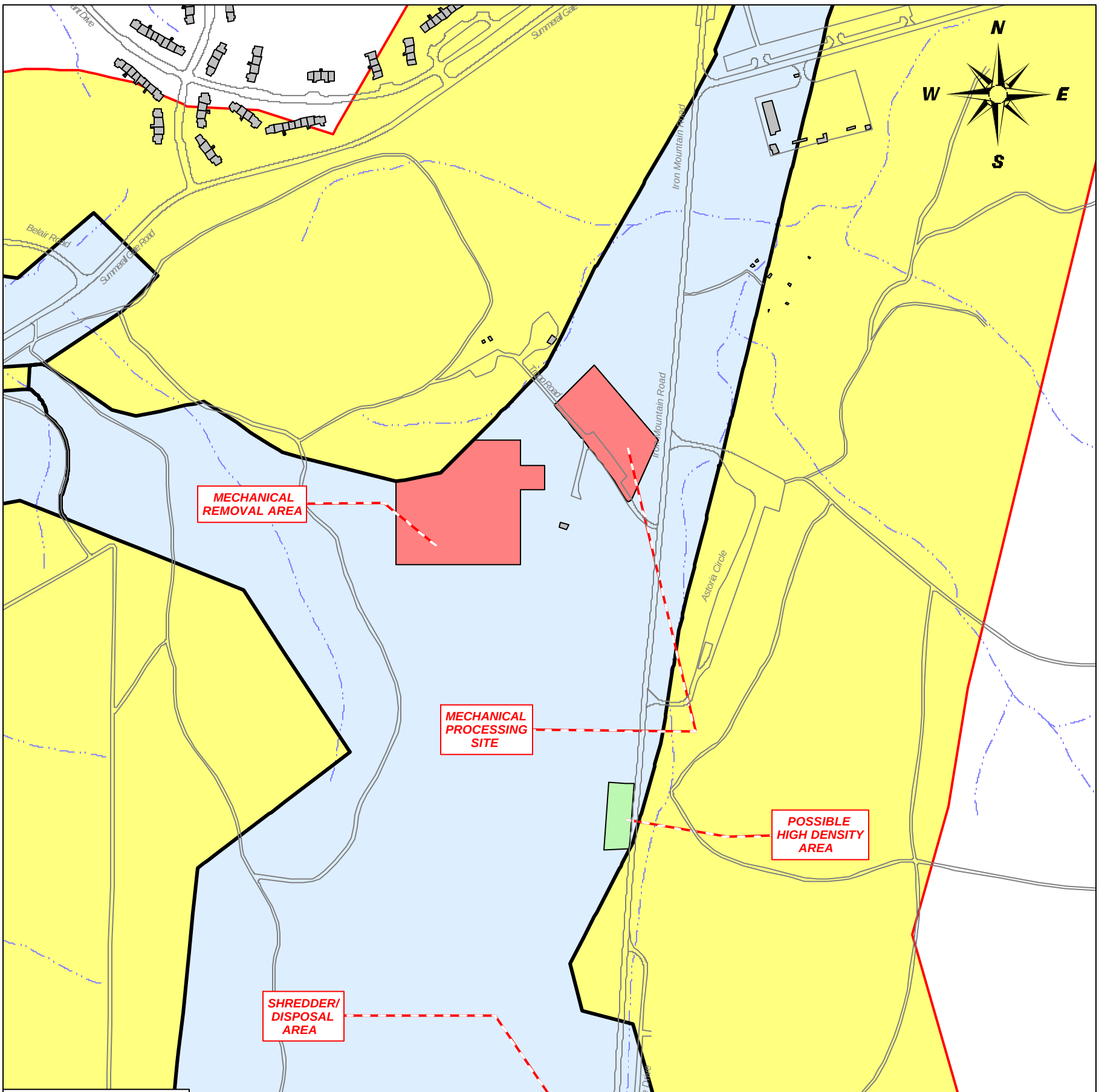
1.1 This Amendment addresses procedural changes to the Fort McClellan Eastern Bypass (EBP) Explosives Safety Submission (ESS). These changes are necessary because there is at least one target area with such a high concentration of Ordnace and Explosives (OE) and OE scrap that manual removal is inefficient. A process incorporating mechanical removal, sifting, and shredding of scrap will be used instead. Armored heavy equipment and standard screening equipment will be used.

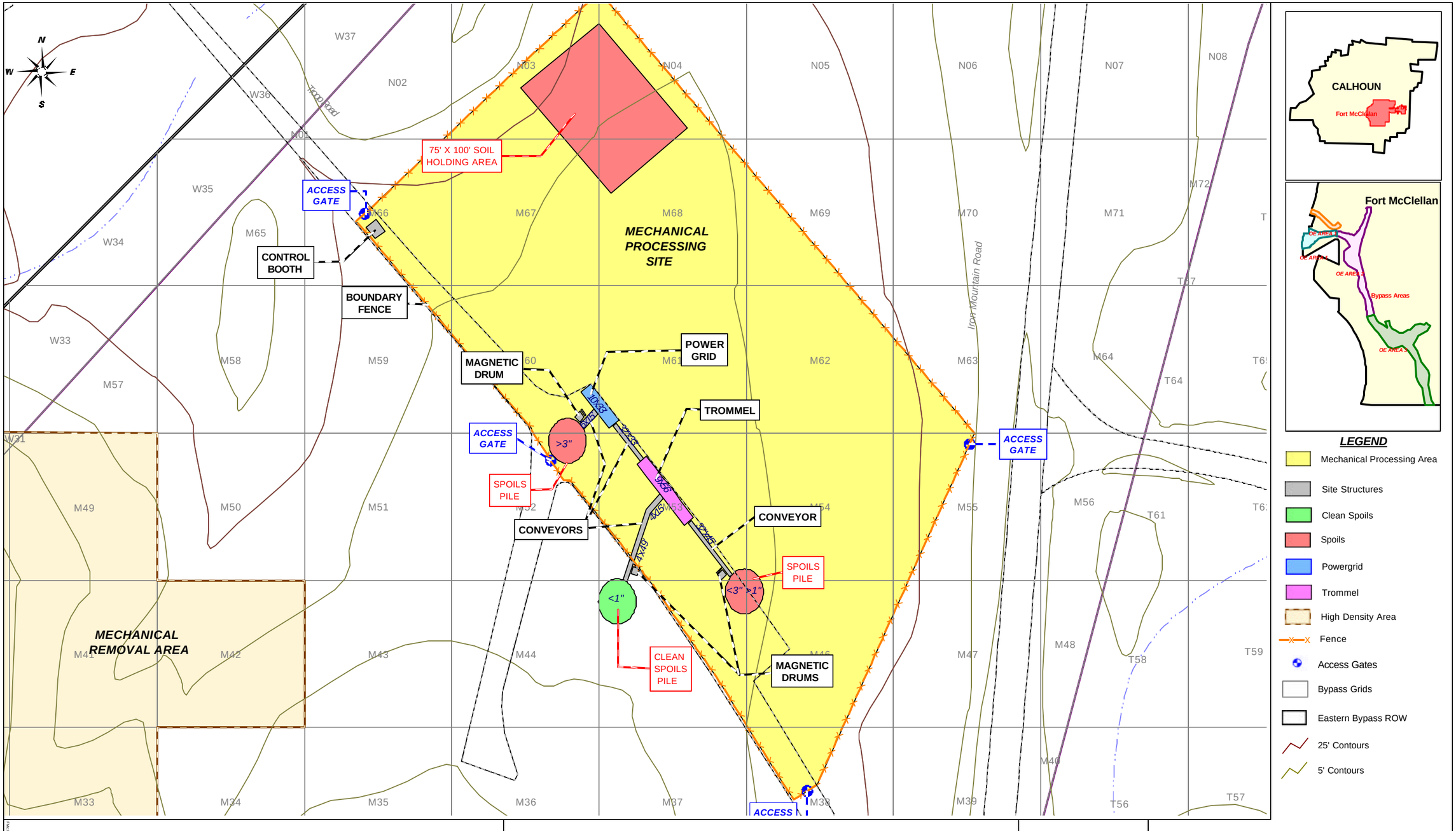
1.2 There is one confirmed high-density area within the EBP Right-of Way (ROW), noted as the Mechanical Removal Area on Figure 1-1. Another parcel is under investigation and will likely be designated a high-density area (See Fig 1-1). If so, it will be mechanically processed after completion of the first area. For this amendment the EBP ROW is defined to include OE Area 2 as identified in the EBP Engineering Evaluation/Cost Analysis (EE/CA) and the additional 40 acres added as a result of ALDOT's request for additional acreage.

1.3 This operation will entail establishing two processing sites in previously cleared areas of the EBP (See Figure 1-1), the Mechanical Processing Area (Figure 1-2) and the Shredder/Disposal Area (Figure 1-3). Sifting and magnetic separation operations will be conducted in the Mechanical Processing Area. The ferrous metal spoils will be inspected and demilitarized in the Shredder/Disposal Area. The inspection will take place in the inspection/demolition area (Figure 1-3) where scrap will be segregated and OE will be blown-in-place. After the scrap is certified inert it may be run through a shredder. These two sites will operate independent of one another, but will maintain communications to allow for the smooth transfer of metal spoils from the Mechanical Processing Area to the Shedder/Disposal Area.

1.4 All personnel in the Mechanical Processing Area of this project will be protected by appropriate armoring of the equipment operator stations and/or the control booths. None of these personnel are allowed outside the protective armor while mechanical removal operations are underway.

1.5 An innovative technology demonstration for direct disposal of UXO using a ringmill, lowspeed shredder may be conducted at Ft. McClellan, after al other mechanical removal, processing, and disposal operations have been completed. This testing is described as separate operation at Section 8.0 of this Amendment.


N
W
E
S
MECHANICAL REMOVAL AREA
MECHANICAL PROCESSING SITE
POSSIBLE HIGH DENSITY AREA
SHREDDER/ DISPOSAL AREA
Iron Mountain Road
Summeral Gate Road
Belair Road
Tyson Road
Astoria Circle
Lucerne Drive
Bypass Areas
OE AREA 1
OE AREA 2
OE AREA 3
CALHOUN
Fort McClellan
Fort McClellan
0 200 400 600 800 1000 ft
Areas of Concern
Possible High Density Area
Eastern Bypass Area
Eastern Bypass 1181' EZ
Buildings
FOSTER WHEELER ENVIRONMENTAL CORPORATION
Fort McClellan, Calhoun County, Anniston, Alabama
October 2002
Figure 1-1
SITE MAP



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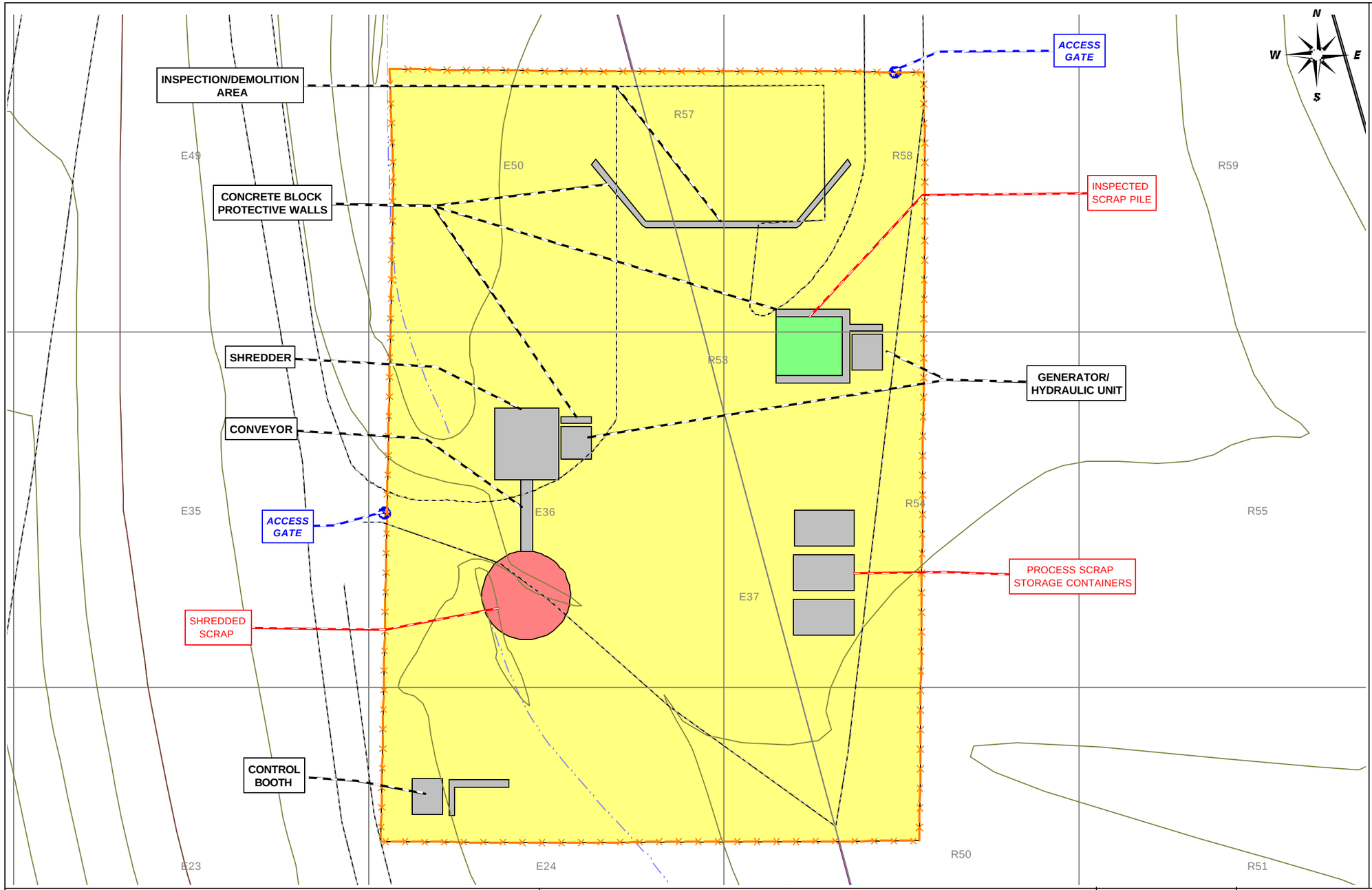
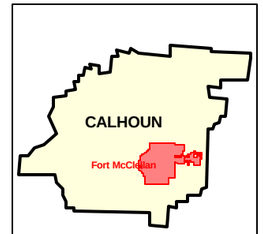
Fort McClellan, Calhoun County, Anniston, Alabama

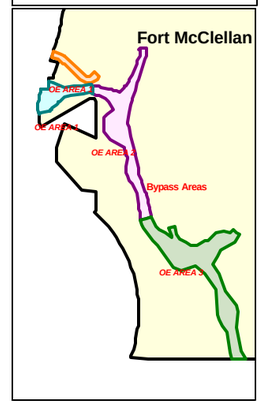
October 2002

Figure 1-2

Mechanical Processing Area Within the Eastern Bypass







LEGEND

- Shredder /Disposal Area
- Site Equipment
- Inspected Scrap Pile
- Shredded Scrap
- Fence
- Access Gates
- Bypass Grids
- Eastern Bypass ROW
- 25' Contours
- 5' Contours

FOSTER WHEELER ENVIRONMENTAL CORPORATION

0 15 30 45 60 75 ft

Contour interval 5 Ft

Fort McClellan, Calhoun County, Anniston, Alabama

October 2002

Figure 1-3

Shredder/Disposal Area Within the Eastern Bypass

2.0 REASON FOR OE

2.1 This Mechanical Removal Area has a known history of being an impact area for 2.36in rockets and 3in Stokes Mortars. The Archive Search Report (ASR), which was conducted in 1999 by the United States Army Corps of Engineers (USACE) St. Louis district, showed the area to be a known range during World War II through 1958 when it was abandoned. The Possible High Density Area, which is currently being investigated, is not mentioned in the ASR. If it is determined this area is also a high density area that will require a mechanical removal, the area will be done following completion of the initial Mechanical Removal Area.

3.0 AMOUNT AND TYPE OF OE

3.1 Previous efforts of manual removal to one foot in the Mechanical Removal Area have taken 12 to 16 weeks per team in some 100 x 100 foot grids. Table 3-1 lists the types of OE and OE scrap that have been found.

3.2 The Most Probable Munition (MPM) for the EBP is the 37mm MKII with a Minimum Separation Distance (MSD) of 1181ft. Even though this area is a known 2.36in Rocket range, 37mm rounds have been found in the vicinity. For consistency we are retaining the 37mm MKII as the MPM for the Mechanical Removal Area.

3.3 Equipment used for the mechanical processing include armored earth moving equipment (excavator [1 ea], articulated dump trucks [2 ea], and front end loaders [2 ea]), a Powergrid screen, Trommel rotary sifter and a control booth. The equipment requiring armor, will be armored to a minimum level as calculated by Dr. Michelle Crull, USAESCH. If there is an inadvertent detonation inside either machine (Powergrid screen or Trommel Rotary sifter) during its normal course of operation, it will be repaired as needed. The control booth will be armored to the same standard as the earth moving equipment. This will consist of at least 9/16in thick armor that has passed ballistic testing and PAS-BR-8 ballistic glass clad laminate with an average thickness of 2.311in and weight of 25.17 lbs/sq ft and 60% light transmission. The armor is fabricated as a slip over unit for the earth moving equipment. The control booth is fabricated from the armor and glass. Appendix A contains information on the equipment and shop drawings of the armor, Appendix B is a memorandum for the file from Porter Morgan, USACE Technical Manager, OE Removal Projects, Ft. McClellan, which contains information on the explosive effects of the 2.36in Rocket. A stand-off distance of approximately 13 feet is sufficient to prevent penetration of the specified armor by a properly functioning 2.36-inch High Explosive Anti-Tank (HEAT) warhead. All equipment operators are separated from the effects of a potential HEAT round detonation by either the stand-off distance or a combination of stand-off and additional equipment components (dump bed body, bucket, etc.) plus the armoring around the operator stations. In addition, the age and condition of the 2.36-inch UXO (over 50 years old), as well as the mechanical process actions significantly decrease the probability that a 2.36-inch HEAT round will be able to function as designed.

Table 3-1
Types of OE and OE Scrap Found In the Mechanical Removal Area

Grid	Item	Comments
All	2.36in Rocket	Fragments, Rocket Motors, Warheads and Full Rounds
L33	60mm Mortar	Fins and Fragments
L34	60mm Mortar	Illumination Round
M42	37mm Projectile	Armor Piercing- Tracer (AP-T)
M42	3in Mortar	Stokes, Fuzed, Sand Filled

4.0 START DATE

4.1 The intrusive component of the Removal Action under this Amendment is scheduled to commence after the approval of this document. Operations must start by November 2002. Failure to meet this date will have a significant potential to delay this action until the summer of 2003. Time is the critical factor in completing the work on the Eastern Bypass this calendar year, prior to beginning of the wet weather season in Alabama, which normally starts in December and runs through April. The following elements have significant potential for delaying the remaining OE and metal scrap removal work such that site removal work could not be completed until the summer of 2003:

- Review and approval of this ESS Amendment.
- Equipment failure or malfunctions that cannot be repaired/replaced in a timely manner.
- Abnormal and/or long-duration wet weather events starting in December causing muddy conditions for more than a few days.

5.0 CLEARANCE TECHNIQUES

5.1 Introduction

5.1.1 With the high density of OE located within the Mechanical Removal Area the standard method of geophysical survey followed by manual intrusive operations is both cost prohibitive and raises safety concerns with OE so closely packed in the soil. The previous geophysical surveys were so heavily contaminated with OE/metal scrap that individual targets could not be distinguished. The planned removal method is to remove the soil by armored excavator and transport the contaminated soil to the Mechanical Processing Area with an armored articulated dump truck. Depth of soil removal will typically range between one and five feet. To separate the OE/metal scrap from the soil, a Powergrid shaker will be used, which will feed into a Trommel rotary screen. The two units will be connected by a system of conveyor belts, which contain a magnetic separation drum at the end of each conveyor. The magnetic separation will remove any metal debris from the soil and deposit it into containers. The process should allow for the safe separation of OE and metal scrap from the soil with little manual contact. All metal removed will be taken to the Shredder/Disposal Area. All metal determined to be scrap

(OE or Non-OE) will be delivered to the shredder and will be shredded in accordance with the shredder manufacturer's directions. All items determined to be OE will be disposed of in accordance with the original ESS.

5.1.2 Trees within the project limits for the excavation will be dug and removed utilizing an armored Hydraulic Excavator with standard bucket and armored thumb attachment. Trees along with root ball will be picked up, shaken to remove as much soil as possible, and placed in the armored dump truck, which will take the trees to an area within the EBP ROW for manual intrusive investigation. Manual intrusive investigation and UXO/OE removal will be performed using approved magnetic locators and appropriate digging equipment or explosives. If fuzed UXO is discovered in the trees, it will be disposed of in place utilizing approved demolition procedures, and all metal scrap will be taken to the Shredder/Disposal area utilizing armored heavy equipment. The personnel needed for this phase of the project include a combination of 3 equipment operators (excavator and 2 dump trucks) and a safety observer for the tree removal, and two UXO technicians and a safety observer for the tree inspection.

5.2 Mechanical Excavation, Mechanical Sorting, and Transportation of OE and OE Scrap Items

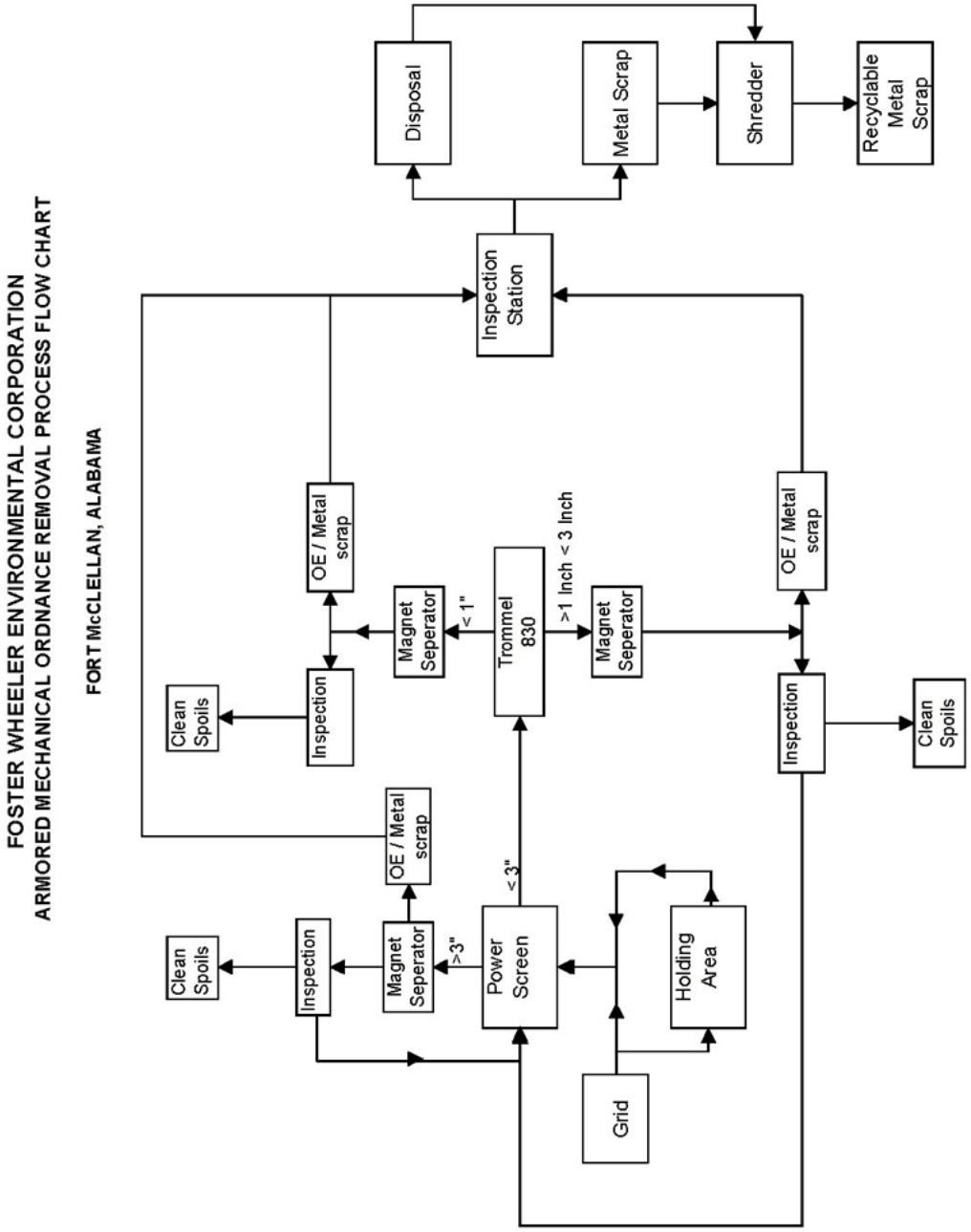
5.2.1 Figure 5-1 provides a schematic flow process diagram for the excavation and processing of soil from the site. The Contractor will establish the Mechanical Processing Area in an area of the EBP previously cleared of OE/metal scrap, approximately 250 feet from the grids to be excavated. Manufactured concrete blocks (2'x'2'x 4') stacked to an appropriate height around selected portions of the processing area will be used to provide protection for the processing equipment from inadvertent damage from the front end loaders. A portion of the initially excavated materials, equivalent to approximately a one-week supply, will be placed in the covered soils holding area on the site to provide the capability to continue operations in the event of severe wet weather conditions during the project life-span. In the event of no rain delays, these materials will be processed at the end of the operation.

5.2.2 A total of 5 personnel are required to conduct the excavation, hauling, and processing of the site soils, 4 equipment operators and 1 UXO Tech III. Soil contaminated by OE and metal scrap is excavated and delivered to the Mechanical Processing Area where it is processed and separated into various size materials. Sizing and magnetic separations will be used to separate the OE/metal scrap items into three distinct sizes. The three distinct sizes of spoils are, (1) greater than 3in, (2) greater than 1in but less than 3in, (3) less than 1in. A magnetic drum will be used on each conveyor to separate metal from the soil. The metal will be deposited into containers for easy consolidation. Figure 1-2 shows the location of the magnetic drums.

5.2.3 The spoil pile that contains items less than 1in is expected to be clean. The pile will be randomly checked by a UXO Technician to confirm/deny the presence of metal in the pile. The remaining two piles (greater than 1in items) will be returned to the Powergrid shaker and reprocessed as needed. The on site safety observer will decide when the items can be manually verified free of OE and moved to the clean spoils pile. Separated

OE/metal scrap materials will be loaded onto an armored dump truck with an armored front loader and delivered to the separate Shredder/Disposal Area or transported directly by the front end loader to the Shredder/Disposal Area for further inspection, disposal or shredding as needed.

Figure 5-1 OE Mechanical Removal Disposal Flow Process Diagram



5.2.4 Start up of the Powergrid shaker, Trommel rotary sifter and conveyer system will be done only when all operators are inside armored heavy equipment. Start up will be done in accordance with appropriate operator's manual. The onsite Supervisor will start the system from inside the armored control booth. An emergency kill switch will be located in the booth, allowing the supervisor to immediately stop the process in an emergency. Operations will be observed from inside the armored control booth, with the aid of remote video monitoring equipment at all times. Manual handling of UXO/OE materials at the Mechanical Processing Area shall be on an "as needed" basis, for example when the equipment becomes jammed and requires hand clearing and/or repairs are needed to the equipment.

5.3 Recovery and Disposal

5.3.1 The operator in the control booth will decide at what point the OE/metal spoils will be removed from the Mechanical Processing Area and delivered to the shredder/disposal area via an armored front-end loader or articulated dump truck. The decision as to when the pile of metal scrap is large enough to take to the Shredder/Disposal Area will be based on the number of potential OE items in the metal container. Dr. Michelle Crull, USACE, has calculated the number of OE items allowed in one container to keep the K24 distance under 100 feet, this calculation is provided in Appendix B. Here the items will be inspected, OE disposed of via demolition procedures while scrap will be certified inert and taken to the inspected scrap pile. The inspected scrap will be shredded as its final demilitarization step. These steps are explained in the following paragraphs.

5.3.2 An Inspection Area will be chosen in the Shredder/Disposal area where consolidated demolition shots can be performed. This area is inside the EBP ROW and will have a wall of manufactured concrete blocks (2'x'2'x 4'), stacked to six feet high. (See Figure 1-3) Once the metal scrap has been delivered it will be spread out using an armored front end loader. The metal will be inspected by a qualified UXOQC and SUXOS, certified inert, and moved to the inspected scrap pile area, where it will later be loaded into the shredder. OE/UXO items discovered at this time will be left in the inspection area and disposal performed. Disposal operations will be carried out by three personnel at the shredder/disposal site. These three personnel will be:

(1) UXO Technician III, Team Leader
(1) UXO Technician II, Team Member
(1) UXO Safety Officer

The SUXOS will be available and on post, but due to the nature of the ongoing daily demolition will not be required on the site for disposal operations. The primary disposal method of OE items will be by perforator or detonation. Demolition operations will be controlled from the control booth which is armored for this function. This same control booth will be used to monitor shredding operations. After disposal operations are performed the item will be certified free of energetic material and will be added to the inspected scrap pile. The shredder will not be operating during the inspection of scrap or

during demolition operations, and demolition or inspection operations will not happen while the shredder is in operation.

5.3.3 All metal scrap will be inspected twice prior to being put through the shredder. The first inspection will be by a qualified UXOQC and secondly by a SUXOS. This will allow the scrap to be certified free of energetic material. This process will allow the shredder to be operated free of explosives and will allow easy disposition of the demilitarized scrap.

5.3.4 A demilitarization technique using mechanical shredding will be employed as an "innovative" demonstration for destruction of metal scrap separated by the mechanical processing of the site materials. This demonstration will only address scrap metal that has been inspected and certified free of energetic material. Manufactured concrete blocks (2'x'2'x 4') stacked to an appropriate height around the shredder will be used to provide protection from damage from the earth moving equipment. An armored, wheeled front end loader will initially feed the hopper for the shredder with the potential for adding a feed conveyor to the system for additional production. Start up of the Shredder will be done only when all operators are inside the control booth and other personnel are outside the fence of the Shredder/Disposal area. Start up will be done in accordance with appropriate equipment operator manual. The onsite Supervisor will start the system from inside the control booth. An emergency kill switch will be located in the booth, allowing the supervisor to immediately stop the process in an emergency. Operations will be observed from inside the control booth, with the aid of remote video monitoring equipment at all times.

5.3.5 The Q-D for the exclusion zone for both the excavation/sifting operations and the shredding/disposal work area is 1181 feet. These exclusion zone distances fall within the work zones originally established for the EBP and therefore require no adjustments and will cause no additional exposures. The Q-D Map is included as Figure 7-1.

6.0 Quality Assurance/Quality Control (QA/QC) Plan

6.1 All excavation and sifting operations will be stopped during the Quality Control/Quality Assurance investigations/inspections of the grids. Upon completion of the excavation a geophysical mapping team will complete a geophysical survey to confirm all anomalies have been removed from the grid. The site geophysicist will review the data and determine if additional anomalies are present. If additional anomalies are located the SUXOS will investigate to determine if they can remove the additional contacts manually or if more excavation is required. If the number of anomalies is limited, and/or widely scattered, the SUXOS will have personnel manually clear the anomalies, if not they will be cleared by further mechanical means. Upon completion of the excavation and successful QC investigation the COE QA representative will complete the QA inspection. This coordinated effort between the Contractor QC and the COE will ensure the sifting operation is not delayed any longer than necessary by personnel in the exclusion zone.

6.2 The three-step QC process will be performed per the original ESS on all phases of the mechanical removal. All team members involved will receive preparatory inspections prior to beginning work and will receive follow on surveillance through-out the process.

7.0 MAPS

7.1 Site Map

7.1.1 Figure 1-1 in this amendment has been added to show the relationship between the Mechanical Processing Area and the Shredder/Disposal Area and to outline the Mechanical Clearance Area and the second Possible High Density Area.

7.2 Target Area Map

7.2.1 Figure 1-2 in this amendment shows the locations and layout of the Mechanical Processing Area in relation to the Mechanical Removal Area. Figure 1-3 shows the layout of the Shredder/Disposal Area.

7.3 Q-D Map

7.3.1 Figure 7-1 is included to show the Q-D for the Mechanical Processing Area and Shredder/Disposal Area.

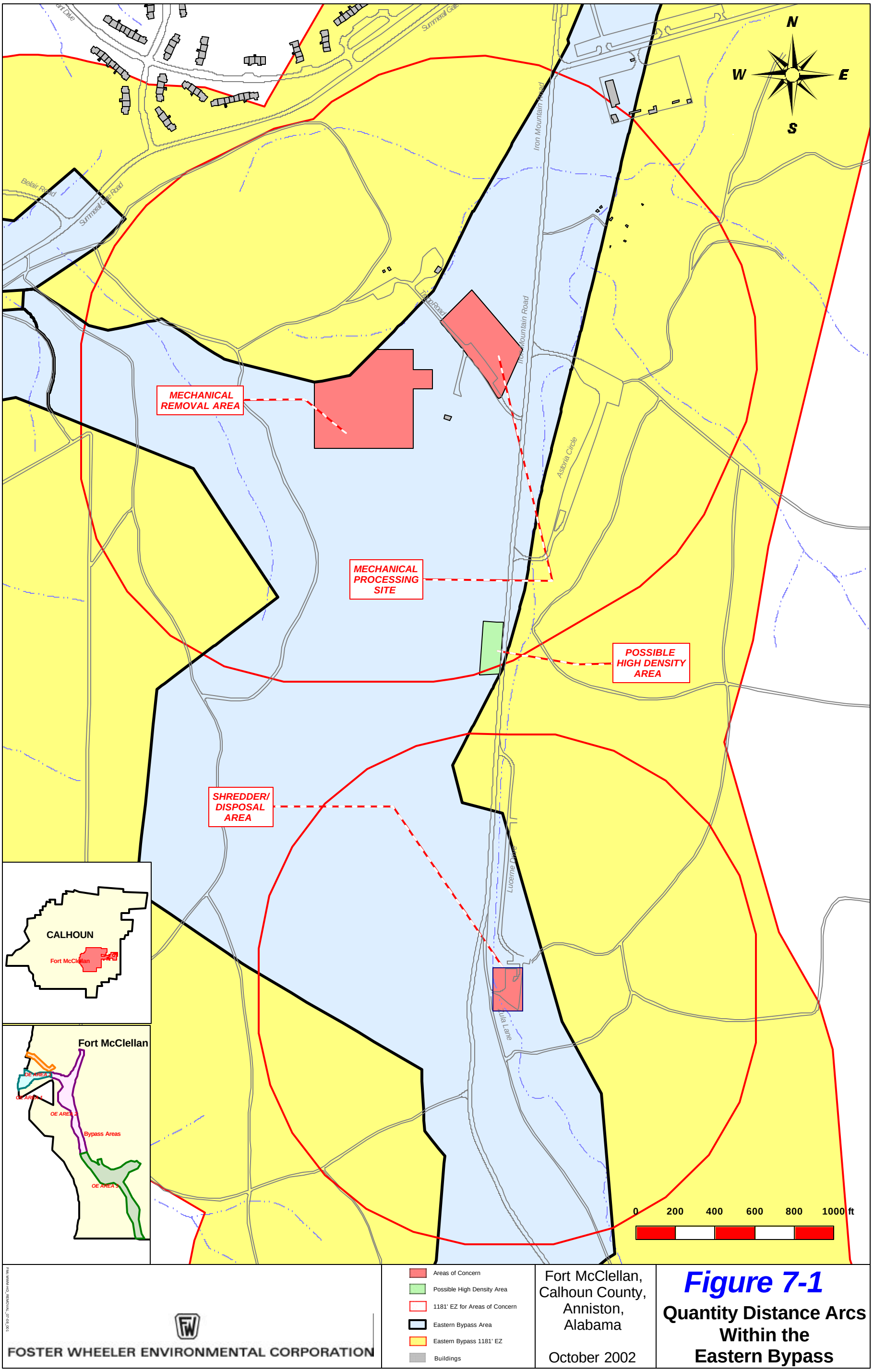

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Figure 7-1
Quantity Distance Arcs Within the Eastern Bypass

8.0 Technology Demonstration for Direct Disposal of UXO by Mechanical Shredding.

8.1 The mechanical ring mill shredder used for the demilitarization and scrap processing, as described in Section 5.3.4, will be used to conduct a limited test of this technology for direct disposal and demilitarization of OE/UXO items. That is, potential OE/UXO and assorted metal debris, not to exceed a 60mm mortar explosive weight per item, will be processed directly through the shredder without any inspection or prior demolition of the items. This innovative technology testing will be conducted after all other mechanical removal, sorting, and disposal operations have been completed.

8.1.1 Initial testing of this technology was conducted at the Redstone Arsenal Technical Testing Center in August 2002. Inert, practice, and certified ordnance scrap and live 60 mm HE mortars were shredded to validate the capability of the mechanics and structural integrity of the machine and its ability to survive detonations of limited size ordnance. These initial tests were successfully completed and demonstrated the capability of the equipment to effectively process both scrap and live ordnance. In order to complete the validation of the technology concept a second phase under on-site, field conditions is required. The use of the Fort McClellan Mechanical Removal Area provides an ideal site for a limited demonstration of collecting and processing potential UXO under similar conditions as would be expected if the technology were fully capable of being deployed.

8.1.2 The test will be conducted in the Shredder/Disposal Area, shown in Figure 1-3. All applicable aspects of this ESS amendment will be incorporated as part of this technology demonstration with respect to safety procedures. The items to be tested will be collected from the Eastern Bypass 2.36-inch rocket target area. The technology demonstration will be limited to a total of no more than 2000 pounds of ordnance and scrap items separated at the end of mechanical sorting process. These separated materials will be stored at the inspection/demolition area, within the secured fence, and guarded during non-working hours, until commencement of the demonstration. It is anticipated that this temporary stockpile will be required for approximately 3 days before the limited demonstration testing can occur.

8.1.3 The total number of 2.36-inch rockets removed from each grid at the rocket target site to date has been documented and can be used to anticipate the remaining levels of concentration for potential UXO rounds. A Net Explosive Weight (NEW) for this stockpile has been calculated based on an estimated number of 2.36-inch rockets that would be likely to occur in a volume of 2000-3000 cubic yards of in-place soils from the site. It is estimated that approximately 15 to 20 potential UXO 2.36-inch rockets will be in this stockpile. Each rocket contains 0.5 pounds of Pentolite explosive compound. The NEW for this stockpile would range between 7.5 and 10 pounds. The K24 distance is less than those shown in Appendix B. In addition, this stockpile will be semi-enclosed by the concrete barrier wall, shown on Figure 1-3, to direct any fragmentation and/or overpressure away from the working area of the shredder and its power and control systems. As a further safety factor the material can be separated into smaller piles within the inspection/demolition area, as necessary, to further minimize the amount of explosives potentially occurring in any one stockpile.

8.2 Standard Test Procedures.

The required test steps and safety checks to conduct this test are listed below:

8.2.1 Delivery of the ordnance/scrap items from the Mechanical Processing Area to the inspection/demolition area will be by armored front-end loader, exactly as for the previous process of inspection, demolition, and demilitarization. Unprotected personnel are not allowed within the QD arc of the Mechanical Processing Area nor the disposal/shredding area during this delivery process.

8.2.2 The temporary stockpile of separated items (UXO/OE and Metal Scrap) within the inspection/demolition area will not exceed 2000 pounds, with any smaller, segregated stockpiles not exceeding 500 pounds each.

8.2.3 Guards will be provided during non-working hours for the duration of the temporary stockpile, or until such time as the testing begins for each day of testing.

8.2.4 The limited testing will be conducted in increments not to exceed 500 pounds of material.

8.2.5 Upon initiation of the testing operations, the Senior UXO Supervisor will control all access to, as well as site activities within the QD distance for the shredder site. Two-way radio and mobile phones will be used for positive control of site operations.

8.2.6 Two UXO Technicians will be stationed within the armored control booth at the site to oversee the tests and provide control of the site.

8.2.7 Upon approval of the SUXOS the start of the testing will begin by having the initial load of items delivered to the hopper of the shredder using the armored front-end loader. The materials will be fed to the hopper by the front-end loader, or by conveyor, if that option has been installed for the previous scrap processing operations.

8.2.8 The armored front-end loader will be moved outside the Shredder/Disposal Area.

8.2.9 The system operator will then start the shredder by remote control from the armored booth and observe the shredding operations via Closed Circuit Television (CCTV). Upon passage of all items through the shredder, the operator will shut down the shredder.

8.2.10 All shredded material will be collected in a steel roll-off box or similar steel container placed beneath the shredder.

8.2.11 A 30-minute wait out period will be observed after shut down of the shredder before personnel will be allowed to inspect the test results.

8.2.12 A SUXOS will then visually inspect the shredder and collection box to determine if any potential UXO remain intact or have potential remaining explosive capability.

8.2.13 Upon an all-clear by the SUXOS, inspection of the hopper and cutter chamber in the shredder will be made to determine if any build-up of explosives is occurring on the cutter disks, hopper walls or other components within the shredding compartment.

8.2.14 Documentation of this test step and the results of the shredding operation will be made with digital video and still photography and field notes to ensure all activities and results are captured for report preparation.

8.2.15 This series of steps will be repeated until all tests are completed.

8.2.16 As a final cleanup process for the shredder, a charge of inert scrap metal and soil will be run through all areas of the cutter chamber to polish/remove any explosives that might have stuck to the metal components of the shredder. A final visual inspection will confirm that the shredder is free of residual explosive compounds.

8.2.17 All processed materials from this testing will be retained in a single, locked roll-off box or equivalent at the shredder until such time as the material can be manifested and shipped to a RCRA approved incinerator for disposal. The limited weight of explosive materials within the total weight of the metal items is expected to be much less than 1% of total weight.

8.3 Procedures for Detonations of Rounds Within the Shredder.

8.3.1 Based on the initial demonstration testing at Redstone Arsenal, the probability of a round detonating in the shredder is very low because of the low-speed operation and the shearing process. However, there is always the potential for a UXO to detonate at any point in this mechanical shredding process. Therefore, in the event that a OE/UXO item detonates within the ring mill shredder during any portion of the testing, specific safety procedures are required to be observed. These steps are listed below:

8.3.1.1 Upon detection of an explosive event in the shredder during operations, the system operator in the armored control booth will observe and evaluate the operation of the shredder via the CCTV system.

8.3.1.1.1 If the shredder is continuing to operate without any apparent damage, the operator will continue to process the charge of materials until the shredder has processed all items into the collection bin beneath the shredder.

8.1.1.1.2 If the shredder has jammed and can not free itself via it's normal reverse cycling process, the operator will shut down the equipment.

8.1.1.1.3 Under either case above, the UXO Tech III will notify the SUXOS, call a halt to all operations at the site, and initiate a 30 minute wait period before leaving the control booth.

8.1.1.1.4 During the 30 minute wait, the operator will attempt to evaluate the conditions inside the shredder hopper and cutting chamber via the CCTV system to determine if any potential UXO items remain in the shredder, which might pose an explosive risk.

8.3.1.2 Upon closure of the 30 minute wait out period, the SUXOS will visually inspect the shredder hopper, cutting chamber, and collection box to determine any residual UXO risk.

8.3.1.3 In the event a potential UXO is in the shredder or the collection box, the SUXOS will arrange for demolition of the UXO item via standard hand demolition procedures. The item will be perforated/blown in place within the shredder or collection box. In no instance will such items be moved, unless the SUXO and Tech III can both validate that the item is incapable of detonation.

8.3.1.4 In the event the shredder was jammed by a detonation within the machine, the clearance procedures in 8.3. b. and c. above will be completed before any repairs are attempted on the machine. Once the machine is determined to be in a safe condition with respect to OE/UXO, the operator and contractor shall determine the requirements for repairs necessary to put the shredder back in operation.

8.3.1.5 Once repairs are completed, the testing will resume using the same procedures and processes as designated above.

8.3.1.6 In the event that the shredder can not be repaired in a timely manner, i.e., 24 hours, the remaining OE/UXO items in the stockpile will be inspected and disposed of via standard hand demolition practices, as were used for the previous disposal operation in support of the mechanical removal and sorting operation.

Appendix A

Shop Drawings and Equipment Information

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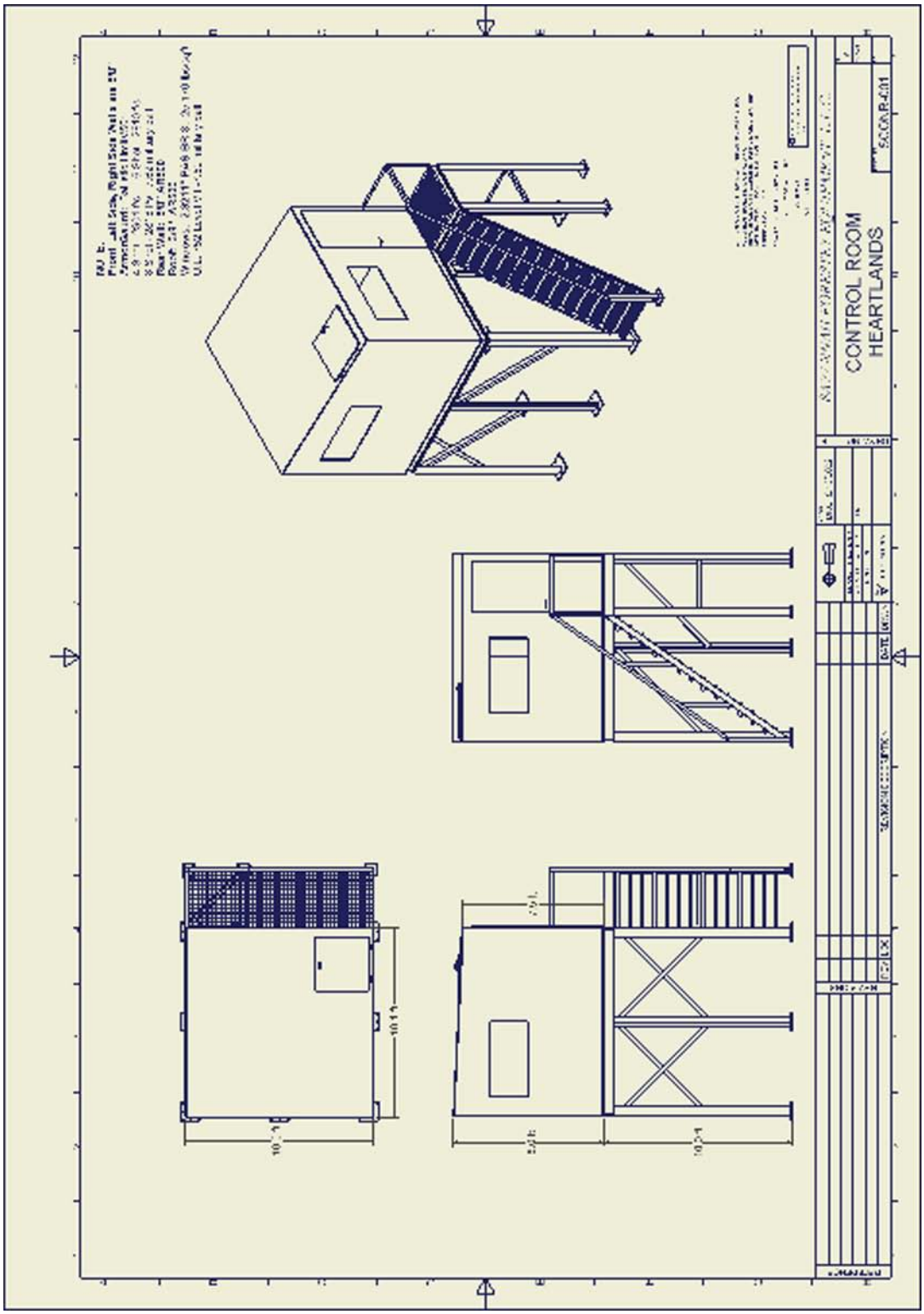
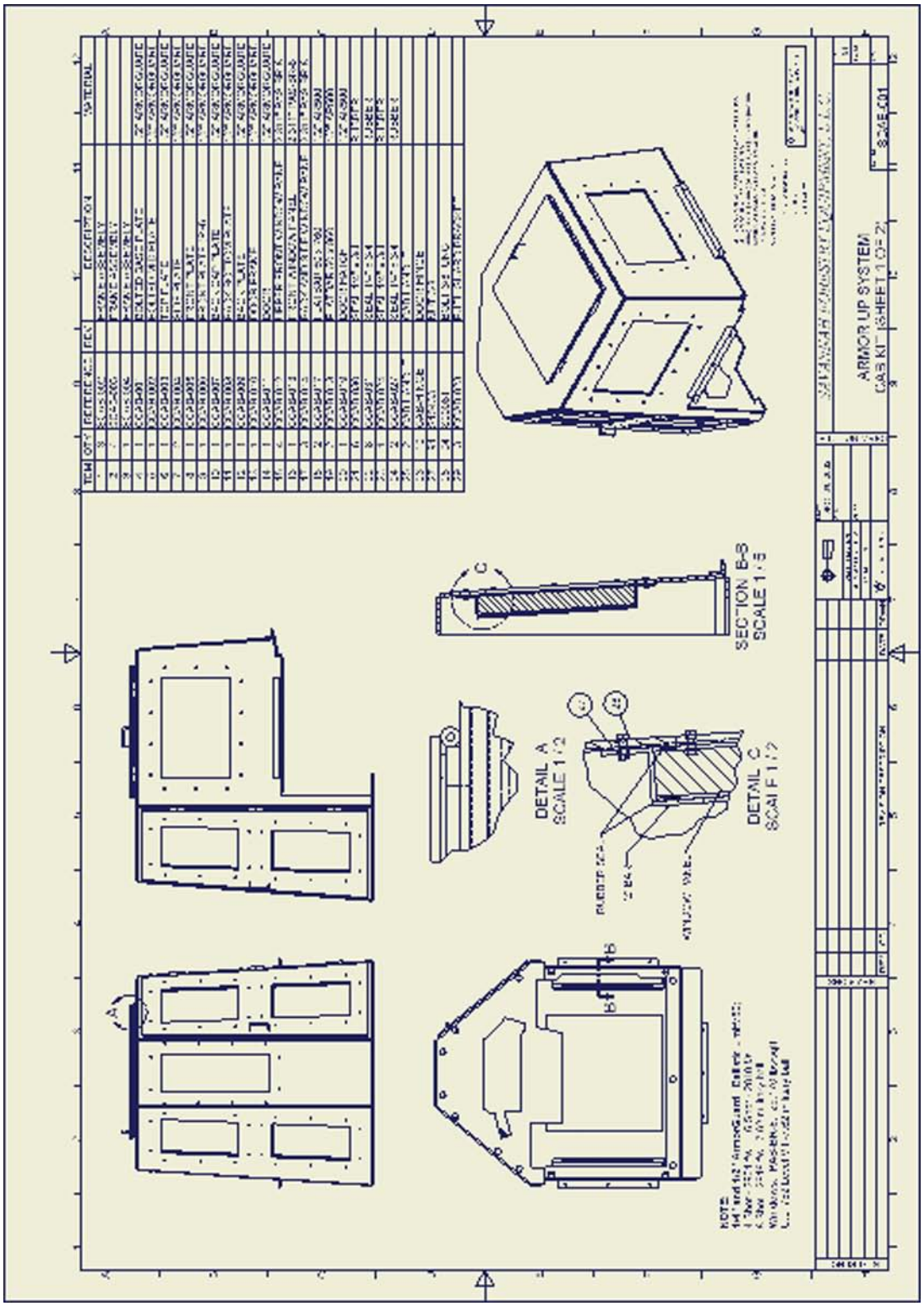
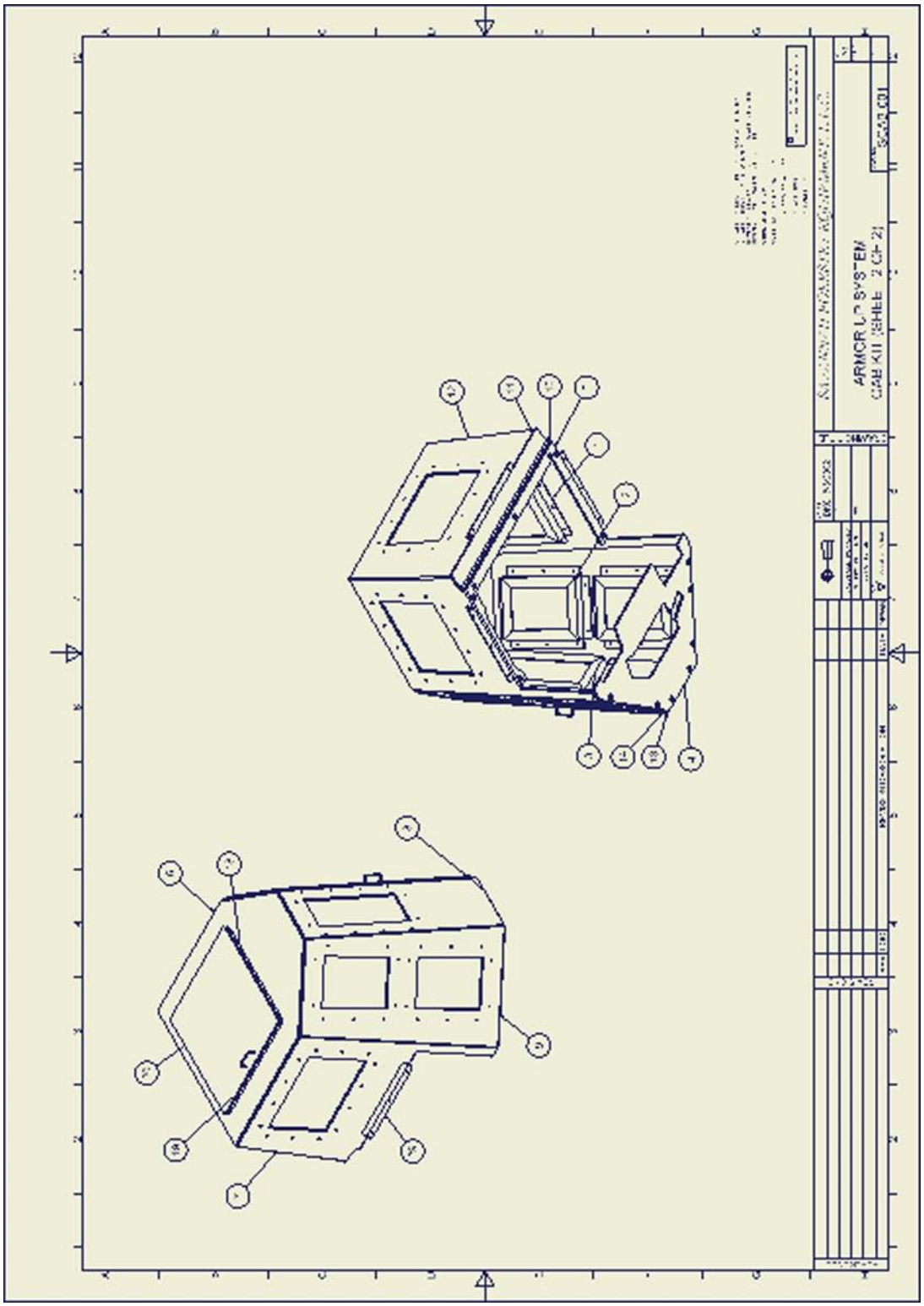
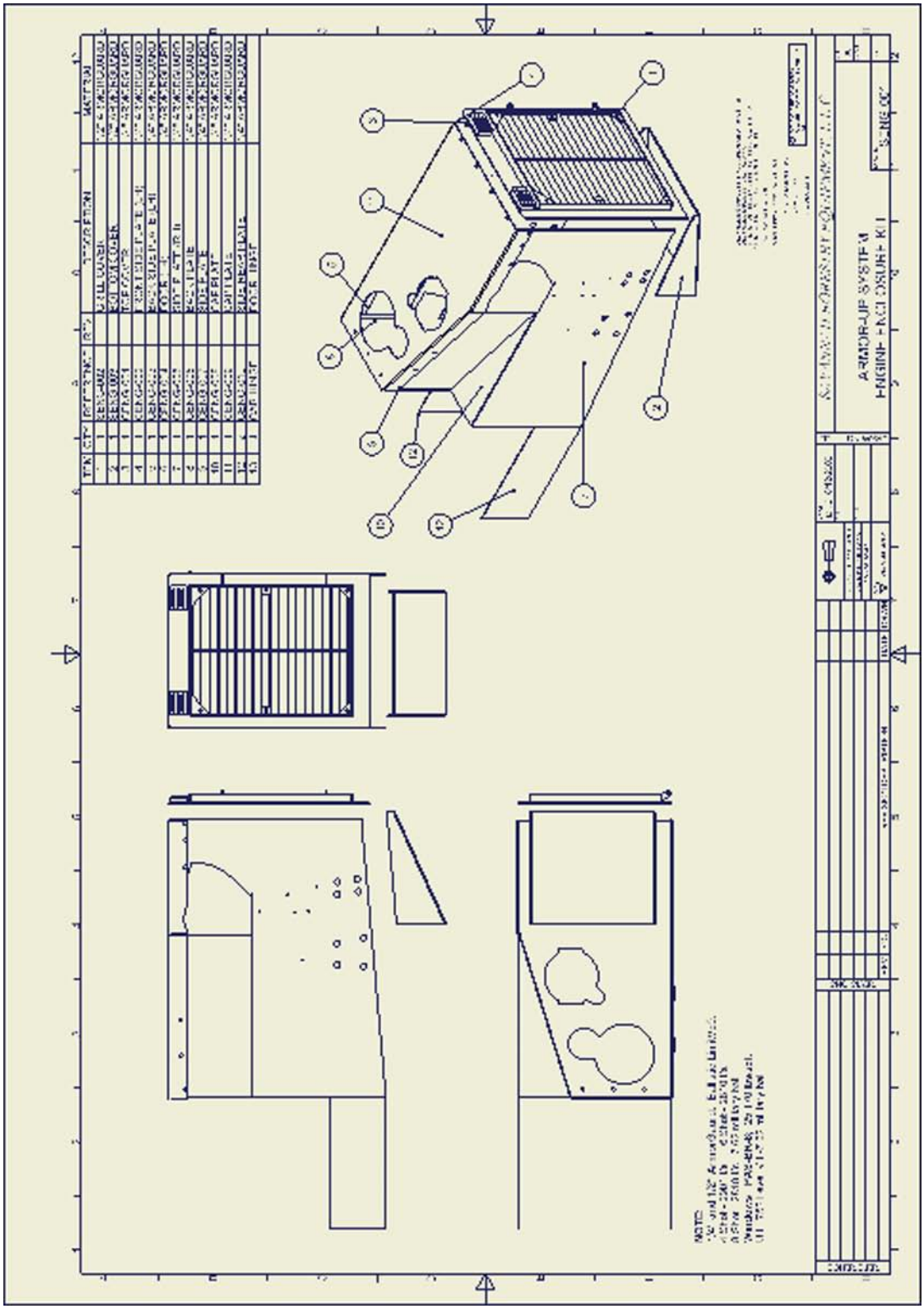
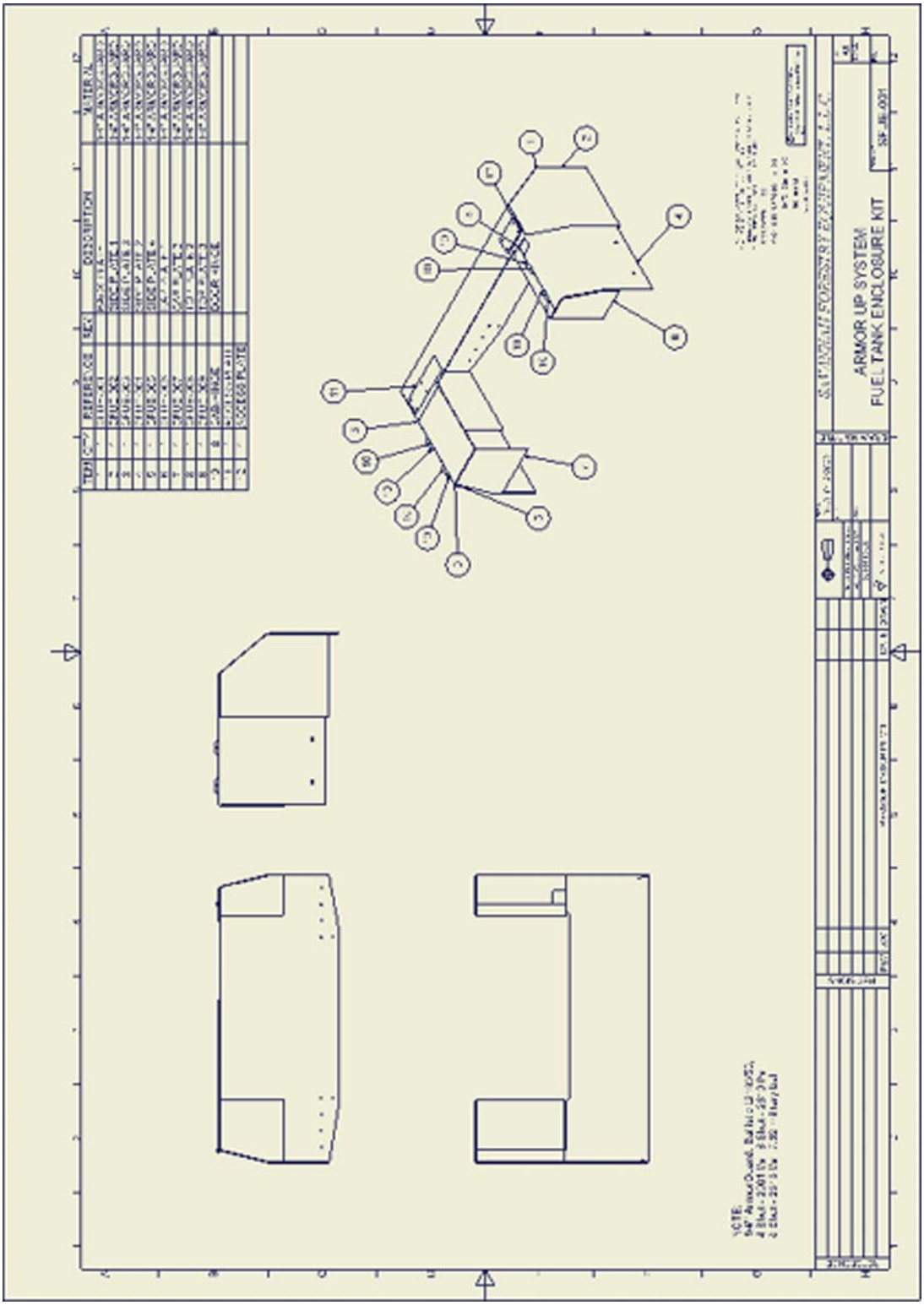

CONTROL ROOM
HEARTLANDS


ARMOR UP SYSTEM
SECTION B-B
SCALE 1 : 3
DETAIL A
SCALE 1 : 2
DETAIL C
SCALE 1 : 2






ARMOR UP SYSTEM
FUEL TANK ENCLOSURE KIT

Powerscreen Sales & Rentals LLC
11901Westport Road
Louisville, KY 40245

Tel: 502 326 9300
Fax: 502 326 9305
Email sales@powerscreensales.com

INTRODUCING THE

M70 Conveyor

M70 Conveyor
Technical Specification

M70 Conveyor Jan.1999 Page 3

The Powerscreen Mobile 70 is a radial loading and high capacity stockpiling conveyor which is strong and economical to run. The M70 is an integral part of the Powerscreen system and has been developed to operate in situations where the M60 does not have sufficient production capacity.

The M70 has an 800mm (32") wide conveyor belt and can handle up to 500 Tonnes (560 U.S. Tons) per hour, and is primarily designed to operate in conjunction with the Powerscreen Commander and Titan high capacity screening plants.

The M70 can either be driven by its own powerunit, as a 'coupling' conveyor or by an electric motor.

The portability of the M70 allows it to work in confined spaces and also where heavier conveyors would find it impossible to manoeuvre.

The M70 consists of a ballast box, feedboot, conveyor, radial wheels and has optional drives.

Ballast Box:

This is attached to the main frame directly below the feed boot and when filled with sand acts as a ballast. The conveyor swivels from this centre point when the wheels are turned radially.

Feed Boot:

The feed boot directs the sand, gravel, coal etc. onto the conveyor belt.

Conveyor:

The main frame can be raised or lowered with a hydraulic cylinder giving two alternative stockpiling heights. The conveyor belt can be either plain or chevron, 2 ply, 800mm (32") wide.

Radial Wheels:

The conveyor is mounted on two swivelling wheels to give radial stockpiling through an arc of approximately 180 degrees.

INTRODUCING THE
Powergrid 1200

With Optional Long Folding Conveyor

Powergrid 1200 Long Conveyor Technical Specification

Powergrid June. 1999 Page 2

FEATURES

• Total weight	15,500kg (34,180lbs) approx
• Width (transport)	2.47m (8' 1")
• Length (transport)	10.765m (35' 3")
• Height (transport)	4.000m (13' 1.5")
• Screenunit	2 deck 2 bearing 3.048m x 2.134m (10' x 7")
• Powerunit	Deutz BF4L1011f (70 Hp)

ADVANTAGES

- High capacity 600+ TPH, (depending on mesh sizes and material type).
- Quick set up time typically under 5 minutes.
- Maximum mobility with fifth wheel, jacking legs, road wheels, springs, brakes and mudguards.
- High performance hydraulic system – David Brown pumps, Danfoss motors and Commercial control valves.
- Angle adjustable screenbox
- Hydraulically folding main conveyor with 3.680m (12') stockpile.

APPLICATIONS

- Sand and gravel
- Topsoil
- Coal
- Crushed stone
- Recycling
- Demolition

POWERSCREEN
A Terex Company

Powerscreen Sales & Rentals LLC
11901 Westport Road
Louisville, KY 40245
Tel: 502 326 9300
Fax:502 326 9305
Email: sales@powerscreensales.com

INTRODUCING THE

Trommel 830

All specifications subject to change without prior notice.

Trommel 830

Trommel 830
Technical Specification

Page 2

FEATURES

• Total weight	33,000kgs (36.3 US tons)
• Height (Transport)	4.000m (13'1")
• Length (Transport)	16.203m (53' 2")
• Width (Transport)	3.334m (10' 11")
• Height (Working)	4.865m (15'11")
• Length (Working)	17.250m (56'7")
• Width (Working)	7.082m (23'3")
• Hopper capacity	9.0 m^3 (12.0 yds^3)
• Screen Drum	2.483m x 9.170m (8' x 30')
• Powerunit	Deutz BF6L913 100 kW (135 Hp)

ADVANTAGES

- High Capacity Screen - Depending on Mesh Size and Material Type
- Rotating Screen -Area of approx. 51m^2(550 ft^2)
- Quick set-up time - typically 15 minutes
- Conveniently Located Control Panel Gives Finger Tip Management of all Machine Functions and On Board Diagnostic Controls provide Engine Protection.
- Variable Speed Control on Trommel Drum for Maximum Efficiency
- Heavy Duty Feed Hopper
- Hydraulic Oil Cooler to Maintain Low Hydraulic Oil Temperature
- Compatible with Powerscreen Range
- Complete CE Specification
- Hydraulic Jacking Legs -Assist rapid set-up time.
- Load Sensing System to Control Feed of Material into the Trommel Drum
- Coupling facility for stockpliling conveyors.
- Combustion Air Pre Cleaner

APPLICATIONS

- Wood Chippings
- Topsoil
- Demolition Waste
- Compost
- Recycling
- Coal
- Sand and Gravel

UNLIMITED SOLUTIONS FOR LIMITED RESOURCES

All specifications subject to change without prior notice.

Trommel 830

Trommel 830
Technical Specification

Hopper:

1500mm (60") wide continuous conveyor belt, which is driven by a hydraulic motor with a variable speed adjustment to determine the feed rate.

Screen Drum:

A 2.483m x 9.17m (8' x 30') screen drum, generating a screen area of approximately 51m^2 (550ft^2) is equipped with a variable speed control. The 30 no.1, 380mm x 1,265mm (4'6" x 4'2") meshes are cleansed by nylon brushes, adjustable to ensure efficient cleaning of the meshes. The tumbling action of the drum breaks any dirt or loose particles from the material thus ensuring a much cleaner and solid oversize.

Collection Conveyor:

1500 (60") wide continuous conveyor belt, that carries the fines material from under the screen and feeds it evenly onto the side conveyor.

Side Conveyor:

1050 (42") wide continuous conveyor belt, that transfers the fines material to a coupled stockpiler or to a stockpile. Impact rollers are in place at the feedboot end of the conveyor. The side conveyor can be mounted on either side of the chassis, to facilitate customer's requests or site restrictions, and can be hydraulically folded for transport

Tail Conveyor (optional):

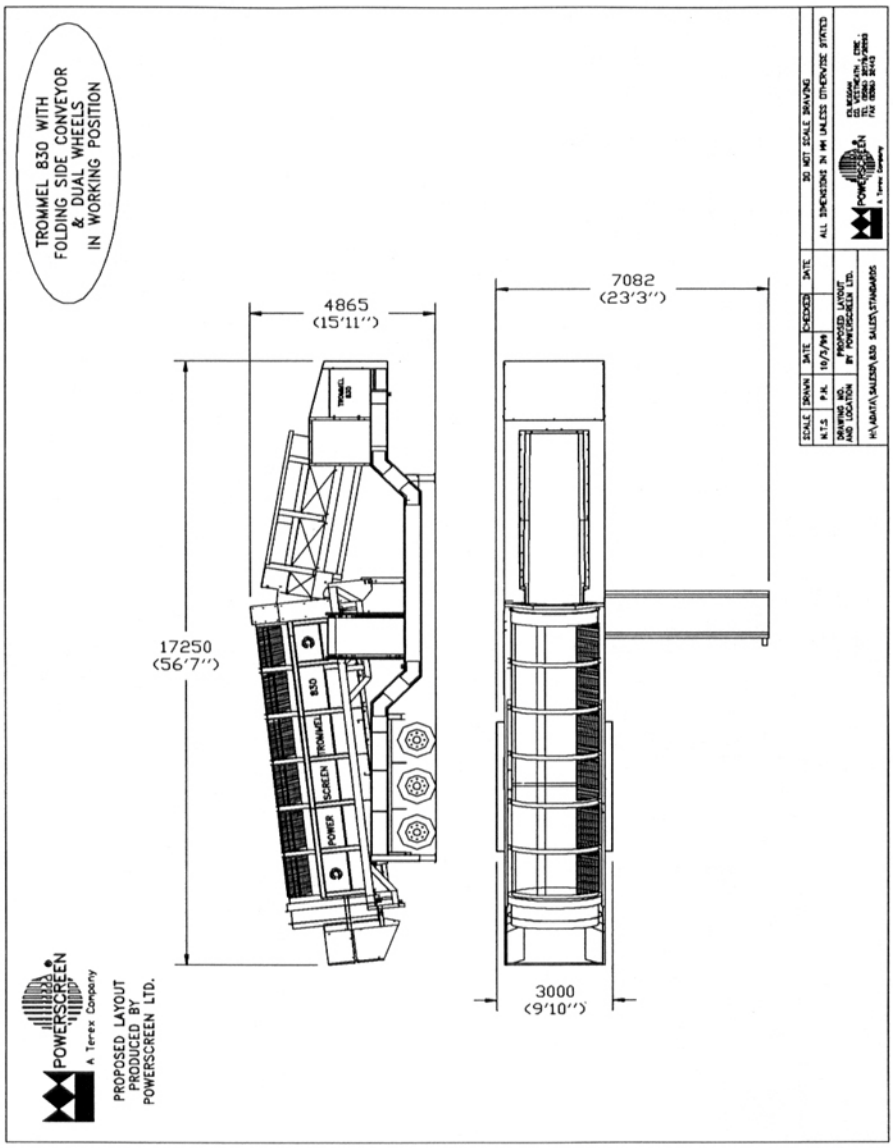
1200mm (48") wide continuous chevron conveyor belt. This conveyor which is fully skirted to prevent spillage, discharges the oversize material from the Trommel drum to a stockpile at a maximum height of 3.019m (9'10''). The impact rollers in the feedboot section of the conveyor are replaced by impact bars. This conveyor also has variable speed adjustment, and can be hydraulically folded for transport.

All specifications subject to change without prior notice.

Trommel 830

Trommel 830
Technical Specification

Page 6



All specifications subject to change without prior notice.

Appendix B

Memorandum For the File and K24 Distance

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22 August 2002

Memo For Files

SUBJECT: Documentation of 2.36-inch H.E.A.T. Rocket (M6A3) Stand-off Distance for Mechanical Removal Using T-1 Armor, 9/16-inch Thickness

1. Reference historical test data from various developmental tests of 2.36-inch HEAT rockets, obtained from Redstone Scientific Information Center, 1 August and 22 August 2002. Also, personal consultations with Dr. David Lydell, Jet Research Center, Halliburton, Inc. were conducted on 8 and 22 August 2002.

2. Characteristic and test data for the 2.36-inch HEAT round were obtained from file documents dated 1943-1944, 1952, and 1953. Additional detailed schematics of the rocket and components were reviewed from ordnance manuals. The HEAT round is composed of a shape charge with the following characteristics: explosive filler – 0.5 pounds of Pentolite, steel cone of 78.7 grams weight, 48 mm diameter at open end, 68 mm in length and a 2.5 mm wall thickness. The nose cone standoff distance to the shape charge is approximately 4 inches. Expected penetration of the shape charge is approximately 3.5 to 4 inches of hardened armor plate.

3. Approximately 95% to 97% of the ordnance used at this site was training rounds (M7 A2/A3). However, the potential detonation of a HEAT round during mechanical excavation and power screen processing poses a problem for protecting the equipment operators. No test data was found which could substantiate the effective distance of the "jet/slug" from the HEAT warhead with respect to detonation in a manner different from intended use. That is, if the round detonated in free space and not at its optimum stand-off distance for maximum armor penetration, at what distance could it penetrate the 9/16-inch T 1 armor proposed to be used on the equipment?

4. Jet Research Center, a division of Halliburton, Inc., specializes in developing and testing jet penetrators (shape charges) for use in oil well development and demolition munitions. Dr, David Lydell is a specialist in shape charge design, having worked for the U. S. Government in warhead development and design. Given the particular characteristics of the 2.36-inch HEAT round he was able to model the effective standoff distance for the proposed T 1 Armor. The modeling indicates that the jet/slug will not penetrate the T 1 (9/16-inch) at a distance of about 13 feet. That is, the jet/slug is a ballistic fragment without the capability to burn through the armor.

5. Historical records indicate that improvements in shape charge warhead design for the 2.36-inch HEAT round were conducted from 1946 through 1953. An improved round (M6A5) was tested in the 1952 –1953 timeframe. The shape charge was changed to include 0.97 pounds of Composition B explosive as a replacement for the Pentolite. This extended the length of the warhead to the rear to accommodate the added explosives. All other characteristic components appear to have remained the same. Extensive design and development was completed on the nose cone and the shape itself since the proper functioning of these two components control the capability to develop optimum penetration of the warhead. A second round of modeling by Dr. Lydell indicates that the added explosive has little effect on the 13-foot standoff distance for the equipment armor. Most of the added explosive force resulted in more fragmentation effects for the round.

6. A records search of the Ft. McClellan Archives Search Report was conducted to determine when the 2.36-inch rocket range was used and abandoned. Based on those records, the range was active during and shortly after World War II. In 1947, Ft. McClellan was inactivated. Ft. McClellan was re-activated in the 1951-1952 timeframe. Troop training in use of anti-armor ordnance was not part of the next few years' activity. The records indicate that the 2.36-inch range was probably closed in the early 1950's. Therefore, the most likely scenario for the 2.36-inch rocket range is that the M6A3 will be HEAT round used at the site for 2.36-inch rocket training.

Porter Morgan
Technical Manager
OE Removal Projects
Fort McClellan, AL
CEHNC-ED-CS-G

Ft. McClellan - Rocket City
Distance between metallic scrap pile & operator booth = 100 ft
Remote operator distance = K24 (C2.4.3, DoD 6055.9-STD)

Maximum NEW (lbs) based on remote operator distance = 72

Munition	Explosive Type	Explosive Weight (lb)	TNT Equiv Explosive Weight (lbs)	Total No. of Munitions of This Type Allowed in Scrap Pile
37 mm MK II (0.053lb)	TNT	0.053	0.0636	1137
M9 Rifle Grenade	Comp B	0.62	0.8928	81
2.36 " Rocket	Pentolite	0.5000	0.9	80
60 mm M49A3	Comp B	0.4200	0.6048	120
60 mm M49A5	Comp B	0.7900	1.1376	64
3 in Stokes	TNT	2.1000	2.52	29
81 mm M374	Comp B	2.0900	3.0096	24
81 mm M43	Comp B	1.2900	1.8576	39
81mm M362A1	Comp B	2.1000	3.024	24
81 mm M56	TNT	4.3000	5.16	14

Calculated By: Michelle Crull, PhD, PE
Date: 20 August 2002

Appendix C

Exclusion Zone Information for 37mm Projectile

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Minimum Separation Distances
Ft. McClellan
37 mm Mk II
2 August 2002

REQUESTED BY: Dan Copeland
PREPARED BY: Michelle Crull, PhD, PE

This form shows calculated distances only. It does not constitute approval. Concurrence of CEHNC-OE-S is required to determine the applicable distance for a specific site.

In accordance with (IAW) EM 1110-1-4009, use of the range to no more than 1 hazardous fragment/600 sq ft as the minimum separation distance for accidental detonations requires written justification, a risk analysis, calculation of this distance by CEHNC-ED-CS-S, and concurrence of CEHNC-OE-S.

CALCULATIONS FOR UNINTENTIONAL DETONATIONS

Maximum Fragment Range = 980 ft
Range to No More Than 1 Hazardous Fragment/600 sq ft = 200 ft
Range to 0.9 psi Overpressure (K50) = 20 ft

IAW EM 1110-1-4009, the minimum separation distance for intentional detonations may not be less than the default distance provided in DoD 6055.9-STD or the maximum fragment range or the K328 overpressure distance.

CALCULATIONS FOR INTENTIONAL DETONATIONS

Maximum Fragment Range = 980 ft
K328 Overpressure Range = 131 ft (based on munition NEW only, no donor)

The primary fragmentation characteristics used in the calculation of the values listed above were computed IAW CEHNC-ED-CS-S-98-1. The maximum fragment range was calculated using the maximum weight fragment and the initial velocity from these characteristics in the computer software TRAJ. The range to no more than 1 hazardous fragment/600 sq ft was calculated IAW CEHNC-ED-CS-S-98-2.

NOTE THAT ALL MITIGATION METHODS FOR INTENTIONAL DETONATIONS ARE BASED ON THE USE OF COMMERCIAL SHAPED CHARGES FOR INITIATION. IF ANY OTHER DONOR CHARGE IS TO BE USED THIS INFORMATION MUST BE PROVIDED TO CEHNC WITH A REQUEST FOR NEW CALCULATIONS!

1 of 4

Minimum Separation Distances
Ft. McClellan
37 mm Mk II
2 August 2002

SANDBAG ENCLOSURE FOR INTENTIONAL DETONATIONS

Required Sandbag Thickness = 12 in. with 6" standoff between munition and sandbags
Sandbag Throw Distance = 25 ft
Minimum Separation Distance = 200 ft

The required sandbag thickness and the sandbag throw distance were calculated IAW CEHNC-ED-CS-S-98-7. A copy of HNC-ED-CS-S-98-7, "Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions" must be available on site. This report may be downloaded from the USAESCH homepage at http://www.hnd.usace.army.mil/oew/tech/AnalyticalTools/analindx.htm.

WATER MITIGATION FOR INTENTIONAL DETONATIONS

Water Containment System (see HNC-ED-CS-S-00-3)	Minimum Separation Distance (ft)
5 gallon carboys	200
Inflatable pool	200

The water containment system and the minimum separation distance were determined IAW HNC-ED-CS-S-00-3. A copy of HNC-ED-CS-S-00-3, "Use of Water for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions" must be available on site. This report may be downloaded from the USAESCH homepage at http://www.hnd.usace.army.mil/oew/tech/AnalyticalTools/analindx.htm.

MINIMUM SEPARATION DISTANCES WHILE USING MOFB DURING INTRUSIVE ACTIVITIES

Design of the Miniature Open Front Barricade (MOFB) is in accordance with HNC-ED-CS-S-98-8, "Miniature Open Front Barricade". This document was approved by the DDESB. This report may be downloaded from the USAESCH homepage at http://www.hnd.usace.army.mil/oew/tech/AnalyticalTools/analmdx.htm. The first time you access the site you will have to register. You will be notified by e-mail when your login and password have been activated. You must have a login and password to download the report. DDESB has placed certain restrictions on the approved usage of the MOFB. These are listed in the approval letter in the front of the report.

Thickness of Aluminum Required to Prevent Perforation = 0.79 in

2 of 4

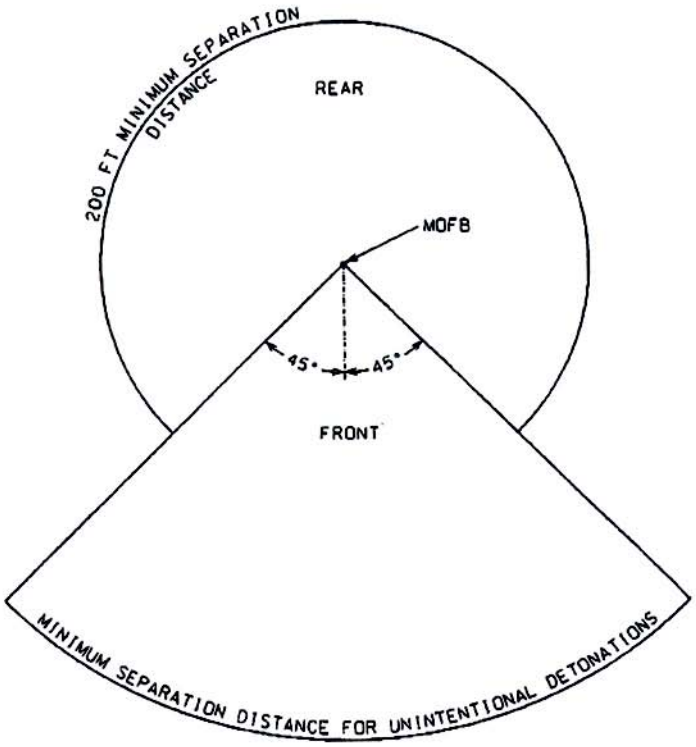
Minimum Separation Distances
Ft. McClellan
37 mm Mk II
2 August 2002

The MOFB is designed to defeat fragments to the rear and sides of the MOFB in the case of an accidental/unintentional detonation during intrusive activities. The fragment distances to the front of the MOFB are the same as the fragment distances without the MOFB (see figure). The MOFB is not designed to reduce the effects of blast overpressure. The MOFB may not be used for intentional detonations. The minimum separation distances to the rear and sides of the MOFB must be maintained based on the expected throw distance of the MOFB itself.

Minimum Separation Distance to sides and rear = 200 ft
Minimum Separation Distance to front = 980 ft
K50 distance = 20 ft

3 of 4

Minimum Separation Distances
Ft. McClellan
37 mm Mk II
2 August 2002



MINIMUM SEPARATION DISTANCE FOR UNINTENTIONAL DETONATIONS
USING MINIATURE OPEN FRONT BARRICADE DURING INTRUSIVE ACTIVITIES

SIGNATURES:

Michelle Crull 8/2/02
Subject Matter Expert

4 of 4